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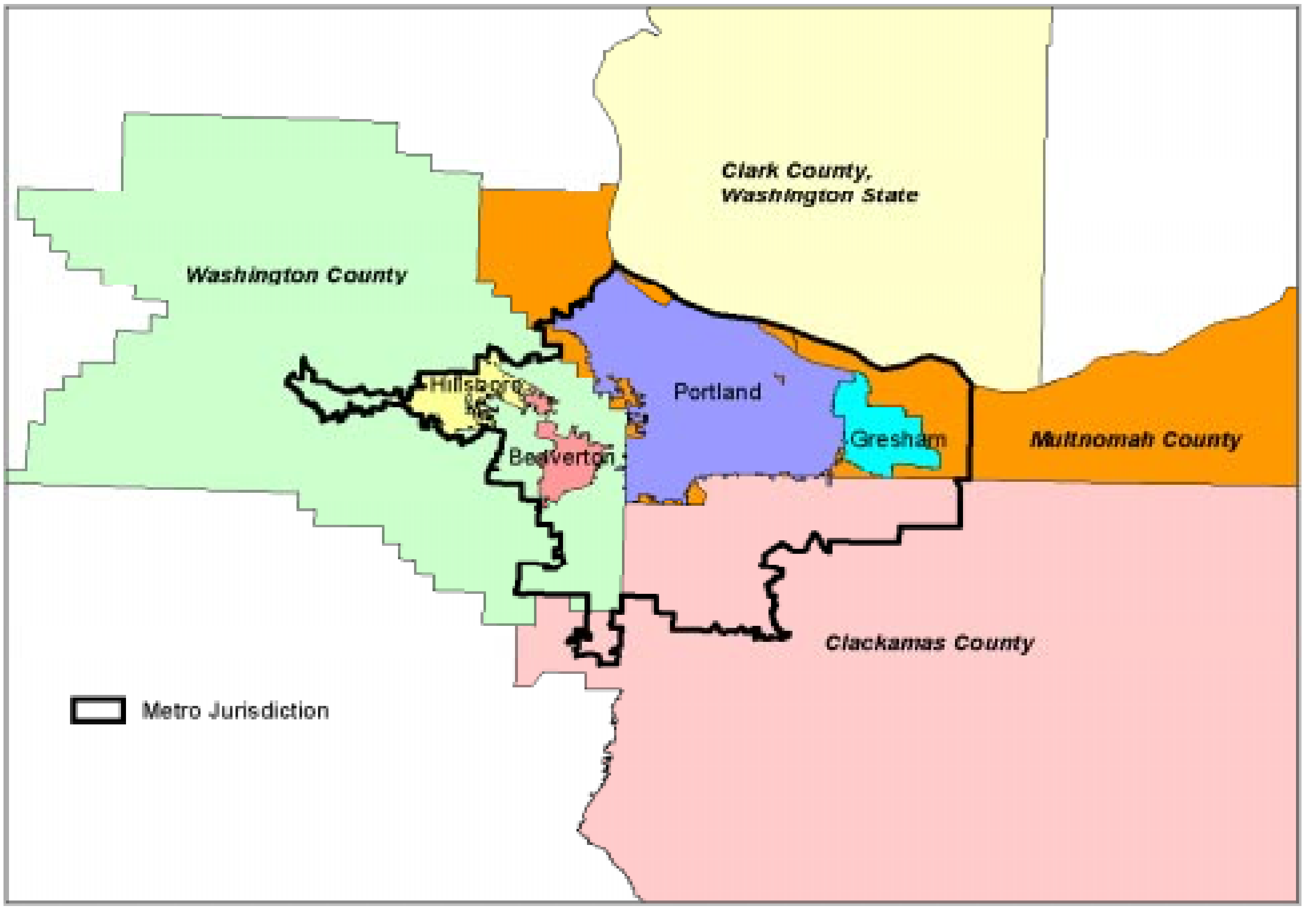
Transportation Case Studies in GIS

Case Study 2: Portland Metro, Oregon - GIS Database for Urban Transportation Planning



Project Summary

Portland Metro is one of the leading users of GIS in transportation planning. GIS is used in a wide range of activities including collation of data inputs to the travel forecasting model, to perform spatial analyses such as measure of jobs-housing balance, and display model outputs on Metro's base map. This "Geo-centric" approach has resulted in many innovative applications of GIS to support modeling including activity-based models and the TranSims Travel Model Improvement Project. Metro is demonstrating how GIS can enhance travel forecasting modeling methods and techniques utilized in transportation and regional planning.

Project Benefits

- GIS enhances capabilities of travel forecasting models
- GIS manages data inputs to and outputs from transportation model
- Consistent means to collect and organize information for validation, analysis, and dissemination
- Helps to support centralized Regional Data Center that acts as a clearing-house and repository for multiple jurisdictions
- Allows easier transfer of data between jurisdictions
- GIS makes the model results more accessible and easier to interpret by wider range of users and policy-makers

Regulatory and Policy Background

Metro is the regional government that serves 1.3 million people who live in Clackamas, Multnomah and Washington counties, Oregon. The region is centered on the City of Portland (1997 population 508,500). As well as being the MPO (Metropolitan Transportation Organization) for the region Metro is also the elected regional government (the only one in the USA) with a mandate to manage growth and authority to provide services in this region.

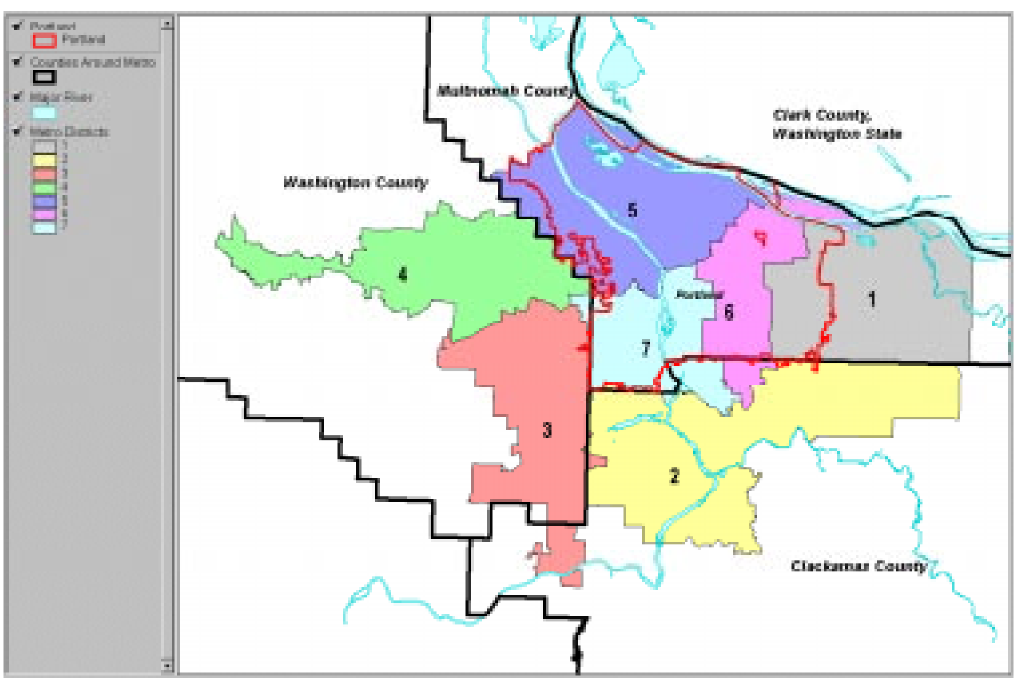
Metro was created by the Oregon Legislature in 1977 and approved by the voters of Clackmas, Multnomah and Washington Counties in 1978 as a directly elected regional government. A home-rule charter approved by voters in 1992 went into effect in January 1993. Metro’s autonomy resulted from citizen action in 1992, led by the "200 Friends of Oregon", and Metro has actively involved public participation in its affairs. For example, the Regional Transportation Plan Citizens Advisory Committee meets monthly to advise Metro during the process of updating the plan.

Metro's jurisdiction is divided into seven districts with an elected counselor for each district who is a member of the Metro Council. To guide implementation of its growth management policies, Metro has produced a **Regional Framework Plan**. This brings together the contents of previous regional policies such as the **Regional Transportation Plan (RTP)** and **Urban Growth Management Functional Plan**. Metro also serves as a data center for the region and collects data on growth forecasts for population, housing, employment and transportation.

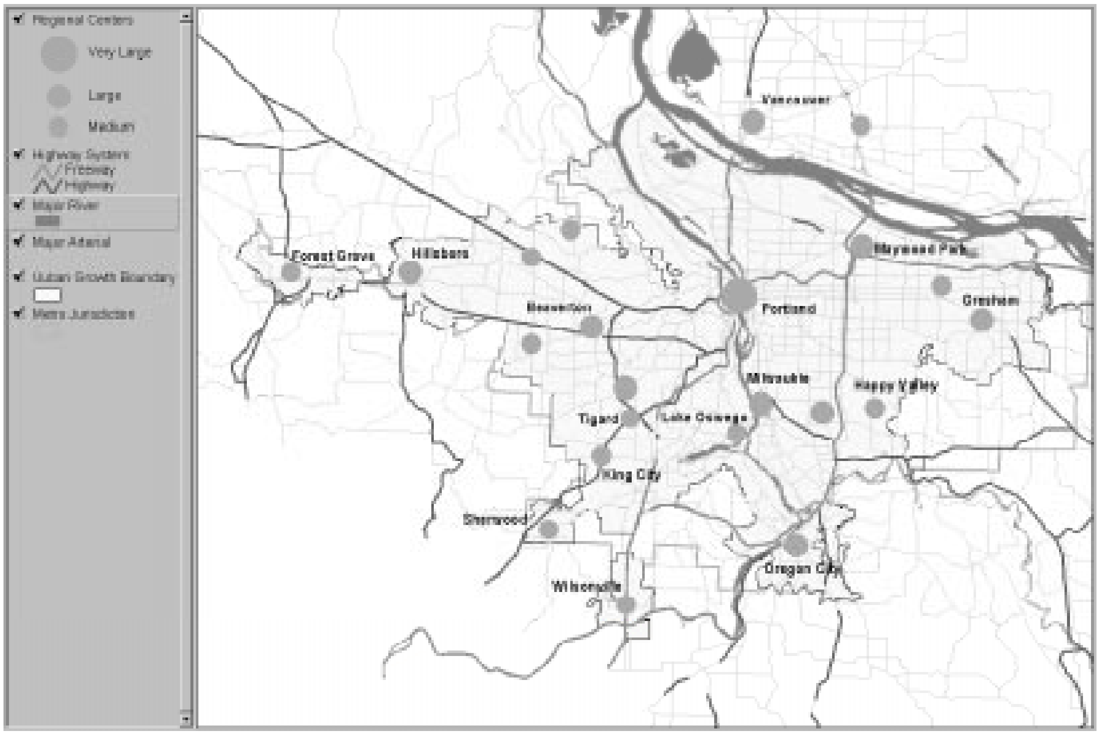
Transportation and land-use planning are key elements in managing this growth. Among the services that Metro manages are regional parks and greenspaces; the Metro Washington Park Zoo; regional garbage disposal, recycling and waste reduction programs; and a number of civic and recreational facilities managed by the Metropolitan Exposition Recreation Commission. The agency also provides technical services to local governments including GIS and modeling.

Regional Framework Plan

The Regional Framework Plan is a comprehensive set of policy guidelines for managing the region's future growth through 2040 and helping create livable communities. The plan is intended to create an integrated land-use, transportation, parks and open spaces planning framework for the region. Unusual among planning agencies in the USA, Metro is proactive in growth management in addition to the normal zoning enforce-



Metro Region Including Districts



Metro Growth Boundary and Regional Centers

ment activities. For example, the agency has a rolling program of preserving trails and greenways through land purchase. It has also been active in the design of livable communities working with architects, engineers, planners and local communities to create master plans for new developments. These emphasize good access to public transport and encourage mixed land uses and higher density development around transit centers. Above all else, the Regional Framework Plan sets limits to the extent of development within communities and defines the urban growth boundary.

<u>Regional Framework Plan Policies</u>

- Establish population and job growth targets for each jurisdiction
- Reduce parking in future developments
- Protect stream corridors and wetlands
- Control location of new large retail stores
- Concentrate commercial development on existing centers
- Manage traffic congestion
- Create affordable housing
- Establish performance measures to monitor plan progress

In July 1996, the Metro Council adopted new policies that support the 2040 growth concept and recognize the critical role transportation plays in the economic health and livability of the region.

<u>Transportation Policy Goals</u>

- Involve the public in all aspects of transportation planning
- Use the transportation plan to leverage development envisioned in the growth concept
- Ensure that both transportation and land-use benefits are considered when making transportation funding decisions
- Place a priority on protecting the region's natural environment and livability

While the new policies provide direction for completing the Regional Transportation Plan, many important choices remain:

- What level of congestion is acceptable and affordable?
- What improvements to the region’s public transportation system are needed?
- How to prioritize the investment of limited regional

transportation dollars to meet the needs of motorists, pedestrians, transit riders, bicyclists and businesses?

Some choices have been made already such as the investment in light rail as the backbone of the region's transit system and a moratorium on any new highway construction.

Case Study and Problem Definition

In trying to implement the RTP, Metro has been faced with several problems/issues:

- How best to serve the region's growing population, forecast to increase to 1.56 million by 2015
- Compliance with the state Transportation Planning Rule, which requires metropolitan areas to reduce reliance on the car and reduce vehicle miles of travel per capita (VMT) during the next 20 to 30 years
- Improving accessibility to employment, education and non-work activities in a situation where traffic congestion is expected to get worse during the plan period

To address these and other issues, Metro determined that they needed to look at a range of transportation system alternatives, each of which tests a different combination of transportation modes.

Transportation Alternatives Analysis

Motor Vehicle Alternatives:
- Vary levels of investment in roadway improvements
- Moderate level of investment in public transport

Transit and Pedestrian Alternatives:
- Vary levels of investment in transit and pedestrian access to transit
- Moderate levels of investment in roadway improvements for autos, trucks and bicycles

To evaluate alternatives such as these, Metro determined that it needed to build a sophisticated travel demand forecasting model that predicts how each alternative would affect transit ridership, traffic congestion, access to jobs, movement of goods and many other factors. The travel forecasting models employed at Metro support all long range planning studies which require travel forecasting in the region (e.g. Region 2040, High Capacity Transit, Congestion Pricing). The RTP is only one reason for increasing the sophistication of the travel forecasting system.

It became apparent that traditional transportation modeling approaches were not sufficient to meet Metro's needs, so the agency implemented a program of travel model improvements that have extended the capabilities of the models. These include:

- Disaggregate data collection using household as unit of analysis
- Activity sites such as employment places analyzed as single units
- Travel patterns modeled as "tours" involving one or more trips as part of "activities chain"
- Pedestrian Environment Factor calculated as indicator of pedestrian access to transit. PEF was found to have impacts on auto ownership, walk, bike and transit mode choice decisions.
- Mixed-use measure of jobs-housing balance

In order to collate and manage the data inputs to the model in the level of detail specified, a more accurate method of locating the data was required. Traditionally, transportation model data are aggregated to traffic analysis zones (TAZ) that represent average values for the factors inside the zones. If a more detailed analysis is required, the conventional solution is to design a finer zone system with a more detailed network. However, in Metro's case it was realized that different data were going to be specified at different levels of detail that needed to be aggregated to different zone systems and network configurations depending upon the alternative analysis being conducted. This disaggregate approach to model building has allowed Metro to capitalize on improving GIS databases to analyze behavior unmeasurable using a zonal based approach.

It was decided to employ a Geographic Information System (GIS) to collate and manage the data needed for the transportation model. The GIS is also used to display the model outputs, such as predicted employment densities, pedestrian environment factor and VMT.

This case study will describe the use of GIS to support the transportation planning and modeling activities. The report also discusses the costs and benefits of GIS in this effort, particularly the infrastructure and skills required for integrating GIS and modeling capabilities.

For details on Metro's model development the reader is referred to documents listed in the references at the end of this report.

Data Resources Center

At Metro, demographic, employment and land-use data for travel modeling are developed within the Data Resources Center (DRC). The DRC is an in-house department responsible for gathering base year data, producing forecasts, and managing the data with an integrated database and GIS.

The GIS is known as the Regional Land Information System (RLIS). RLIS is a system of region-wide base maps and associated databases maintained using Arc/Info GIS from Environmental Systems Research Institute (ESRI). The DRC is presently looking into enhancing the GIS services by managing the spatial and attribute data on a central server using Oracle database and SDE (Spatial Data Engine) from ESRI.

The DRC maintains 75 data layers of demographic, employment, environmental and transportation data for the entire region. These are registered to an enhanced census bureau TIGER line file (streets, census tracts and political boundaries). The DRC is continually improving the base map and attribute data and produces a CD-ROM ("RLIS Lite") of the latest RLIS datasets every quarter. The data on the CD-ROM are formatted as shape files and can therefore be read directly by ESRI's ArcView GIS, which is widely used among agencies in the region.

RLIS GIS Data Categories

GIS Data Category	Number of Layers	Description
Boundary	16	Counties, cities, coundil districts, school districts, metro jurisdiction, growth boundary, zip codes
Census	2	1990 census partial tract boundaries with demographic attributes and geocoded employer locations
Environment	5	Hydrology, topographic countour lines, slope, soil characteristics and vegetation cover
Land Use	5	Environmental zones, parks, geocoded building permits, comprehensive land-use plan and zoning restrictions
Places	4	City halls, fire stations, hospitals, and schools
Streets	10	All streets, county streets, major arterials, arterials and annotation layers
Tax Lots	7	Tax lots in Metro jurisiction, county assessors data, township assessors data, section grids and quarters
Transit	6	Railroads, park & ride ltos, geocoded light rail stops and bus stops, light rail lines and bus routes
Water	12	Watershed boundaries, wetlands, rivers and streams
FHWA	4	Traffic Analysis Zones, geocoded household and activity centers
Model Network	4	EMME/2 network link and nodes, and turn impedances

Source: RLIS Quick Dictionary: A Reference for the Most-Used RLIS Datasets, Metro, July 1997; and RLIS Lite CD-ROM, August 1997.

GIS Capabilities

Metro has invested heavily in developing its GIS capabilities in the DRC and the Transportation Department. The DRC is the primary center of GIS expertise and technology employing specialist staffs trained in Arc/Info programming and spatial analysis, mapping, spatial database design and database management. The agency also utilizes ArcView GIS as a data viewer of the Arc/Info coverages and for simple querying and mapping. ArcView is widely used by DRC and Travel Forecasting personnel. In the Travel Forecasting section, two staff members are GIS programmers and most of the other staff are trained to use ArcView.

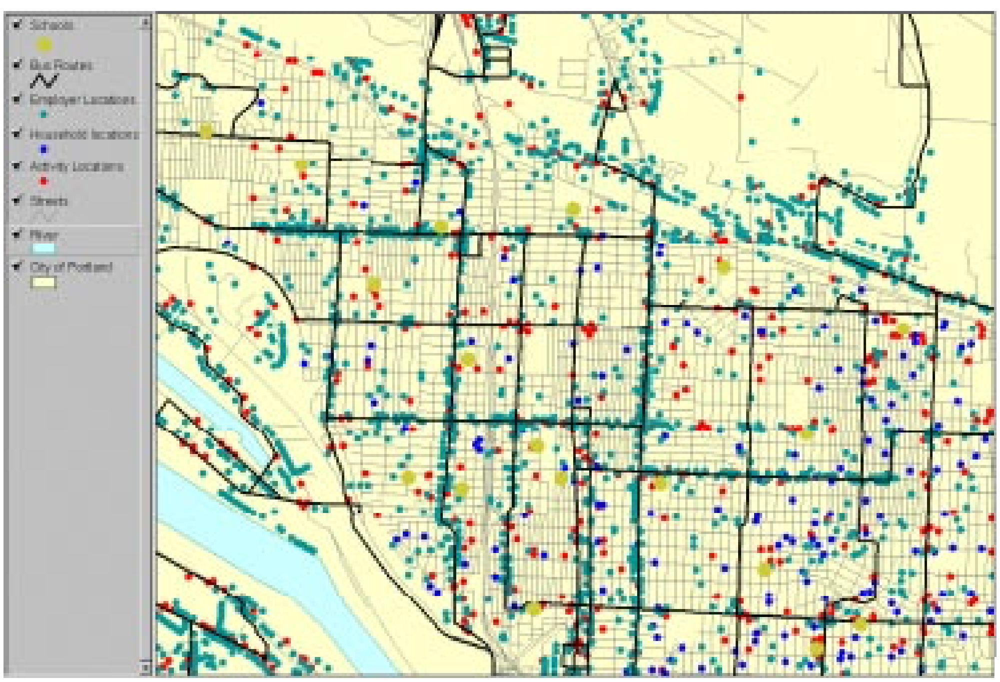
Metro has essentially adopted a "GIS-centric" approach to its planning and modeling activities recognizing that geography is a major factor in urban growth management. Having invested in the GIS infrastructure and trained staff in the skills needed to use GIS effectively, Metro has taken a positive view to make the most use of the technology to support its mandates. Work practices have evolved to take advantage of GIS and new methodologies employed to support the modeling process would be very difficult to implement without GIS capabilities. There is therefore a lot of synergy between the model development and the GIS. This is described further in the next section.

GIS Applications to Model Development

The GIS supports the Travel Forecasting section, which is responsible for the model development and implementation. GIS is used to collate and manage a variety of data inputs and outputs:

1. Geocoding of survey data: household and activity locations, including employment sites, non-work activity centers and transit access and egress locations.
2. Analysis of demographic characteristics such as distribution of income, household size and age of household head
3. Analysis of total and retail employment
4. Analysis of residential and industrial acres (mixed land-use)
5. Analysis of pedestrian accessibility to transit services and of zonal accessibility by different modes
6. Data aggregation to TAZ
7. Mapping and display of model outputs, including results of traffic and transit network assignments

How GIS is used to support each of these components is described below.



Households, Employment Sites, and Activity Centers

Geocoding Travel Survey Data

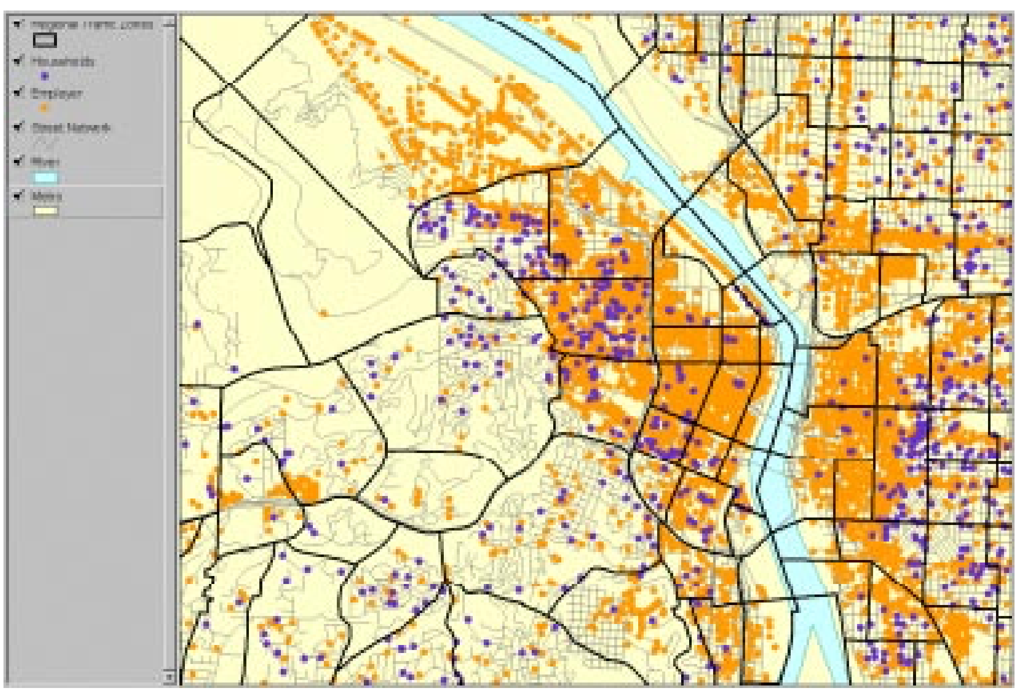
Travel behavior is a complex phenomenon. Nevertheless statistical modeling techniques have been developed that are able to establish the significant factors that effect travel demand. These variables include income, household size, age of household members, access to autos, employment and non-employment activities and accessibility to activity centers. Household survey data captures the range of data that is required to perform these types of analyses.

Household surveys are the foundation from which most travel demand models are constructed. Metro's most recent household survey was performed in 1994/95. This survey was a two day activity based survey. Stratified sampling was used to help collect representative samples of often hard to capture transit, walking, and biking trips. Examples are given in the following sections.

Metro has utilized GIS to geocode the location of households and the activity centers. This provides a precise geographic dataset of the distribution of trip origins and destinations together with the location specific characteristics of household or employment site. With these data it is possible to perform accurate spatial analyses of *trip generation* and *trip distribution* factors. For example, distance or travel time is known to be a important factor in impeding travel: the nearer or shorter the destination the more likely one is to travel to it compared to a more distant location. GIS is able to measure very accurately these types of measures, using actual network distance from each site, to produce an average value for a group of points. In contrast, traditional modeling techniques measure zone centroid-to-zone centroid distances that may be a poor approximation to real world conditions. Thus, using geocoded locations improves the accuracy of the model data and the modeling process.

Analysis of Demographic and Employment Characteristics

Using disaggregate geographic data enables more detailed analysis of demographic characteristics. For instance, within a TAZ there could be significant differences in income distribution. Using household point data these differences can be evaluated to determine whether the zone structure should be amended or whether special factors need to be applied in the averaging process. A similar situation arises with employment and non-employment activity data. Employment sites vary in size and employment composition. The density of employment is an important accessibility factor that may not be fully reflected in zone based mea-



Household and Employment Density

sures. GIS can provide accurate density measures across any surface to highlight the concentration of employment.

Metro makes forecasts of these variables by TAZ. The GIS is used to allocate future household and employment forecasts within control totals for each district and an inventory of available land. The allocation is performed at a quarter acre grid scale and then reallocated to the TAZ geography. The allocations are then sent to local jurisdictions for review and comment.

This demonstrates two of the major advantages of using GIS. First, the allocation of future growth can be done independently of the model zone design to reflect realistic local factors; and second, the results can be distributed to the jurisdictions in digital map form that they can be read and analyzed further.

Mixed Land-Use Measure

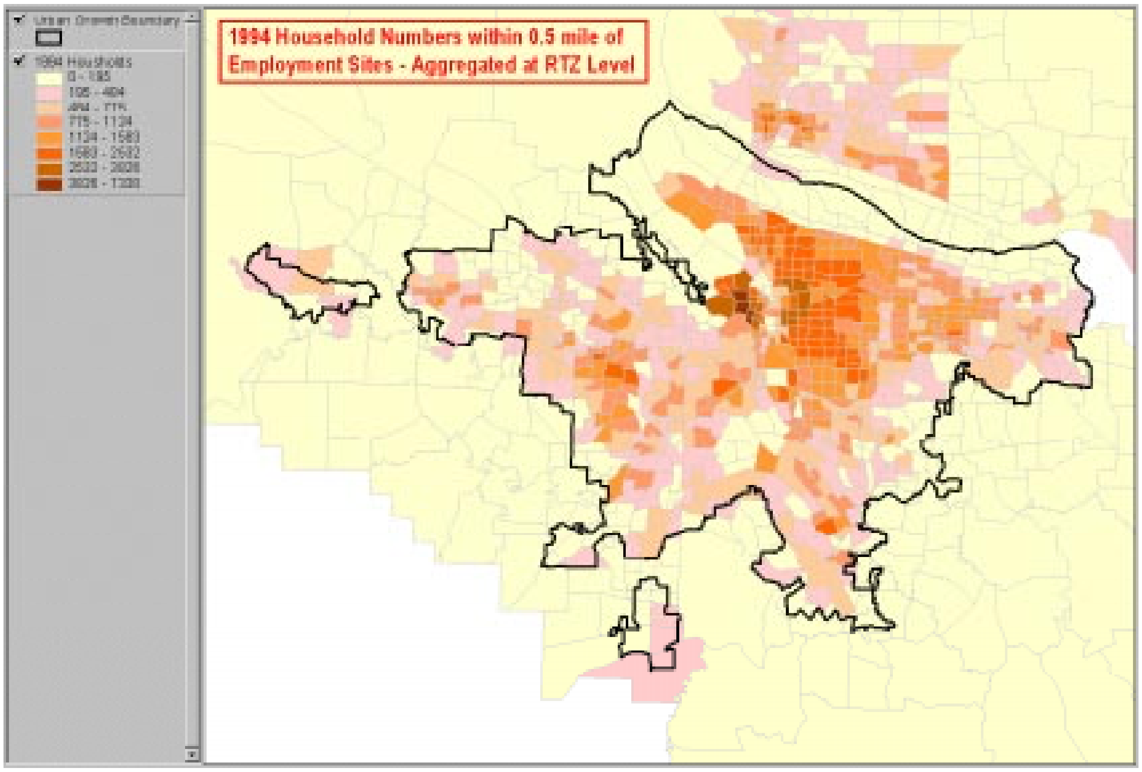
One of the key objectives of Metro's Regional Framework Plan is to accomplish mixed land-use developments that encourage closer proximity between households and employment sites. Experience has shown that more even jobs-housing balance reduces dependence on the automobile (which is more attractive for longer commute journeys). Thus jobs-housing balance promotes travel choice for transit, bicycling and walking journeys.

The modelers compute the jobs-housing balance by analyzing the number of households and jobs within ½ mile of each other. With the GIS they can perform this for any level of zone aggregation and compare the results with transit accessibility to determine which areas require additional transit services to improve employment access, or more mixed development.

Complimentary to the mixed land-use policy is the policy to encourage transit use rather than auto modes. *Mode choice* models have shown that if transit is to compete with the auto it must offer at least comparable travel times and accessibility to destination activities. The Metro region has a comprehensive range of transit services provided by Tri-Met, the three county transit operator and transit planning agency. Tri-Met also operate the light rail system that forms the backbone of transit in the region.

The bus services are planned to feed into the light rail stops, thereby improving suburban access to transit along the light rail corridor. This in turn will help attract new commercial development to these corridors – the more accessible parts of the region. The regional centers are located at places that are well served by transit.

Mixed Land Use around Light Rail Stations



Jobs-Housing Balance In Metro Region

The most transit accessible area of the region is downtown Portland, which provides a hub for the light rail system and bus services.

Pedestrian Accessibility to Transit

An important component of transit trip making is pedestrian accessibility to the bus stop or light rail station. Pedestrian accessibility is often absent from transit modeling activities, in part because zone based measures are not able to determine this factor. In addition, transportation models do not have the capability of analyzing local pedestrian networks in the way that GIS can. The LUTRAQ (Land Use Transportation Air Quality) study conducted in 1991-92 drew attention to pedestrian accessibility as an important planning factor in promoting transit use. The LUTRAQ report recommended development of a Pedestrian Environment Factor (PEF) to measure pedestrian accessibility to transit services. This started out as a non-GIS based measure that examined factors such as the location of street crossings, quality of sidewalks and ease of walking (slope) to create a three-point scale.

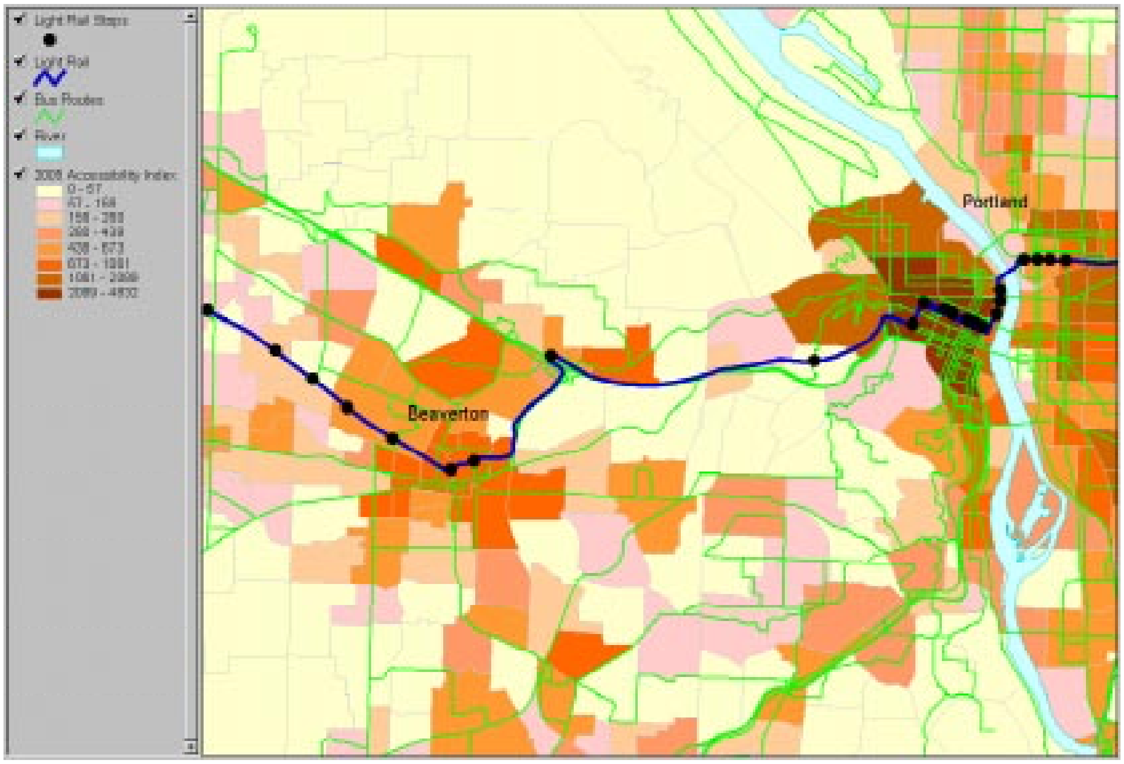
Since then, as GIS databases have become more detailed and refined Metro has been able to replace the qualitative PEF measure with quantitative variables. The current forecasting systems use mixed used and local intersection densities to represent pedestrian friendliness. The enhanced PEF, which also includes parcel size, slope and accessibility is used for pedestrian planning. A more sophisticated and comprehensive index has therefore been developed with a broader scale – the higher the score the more pedestrian accessible or pedestrian friendly is the neighborhood toward transit.

Pedestrian Environment Design Criteria

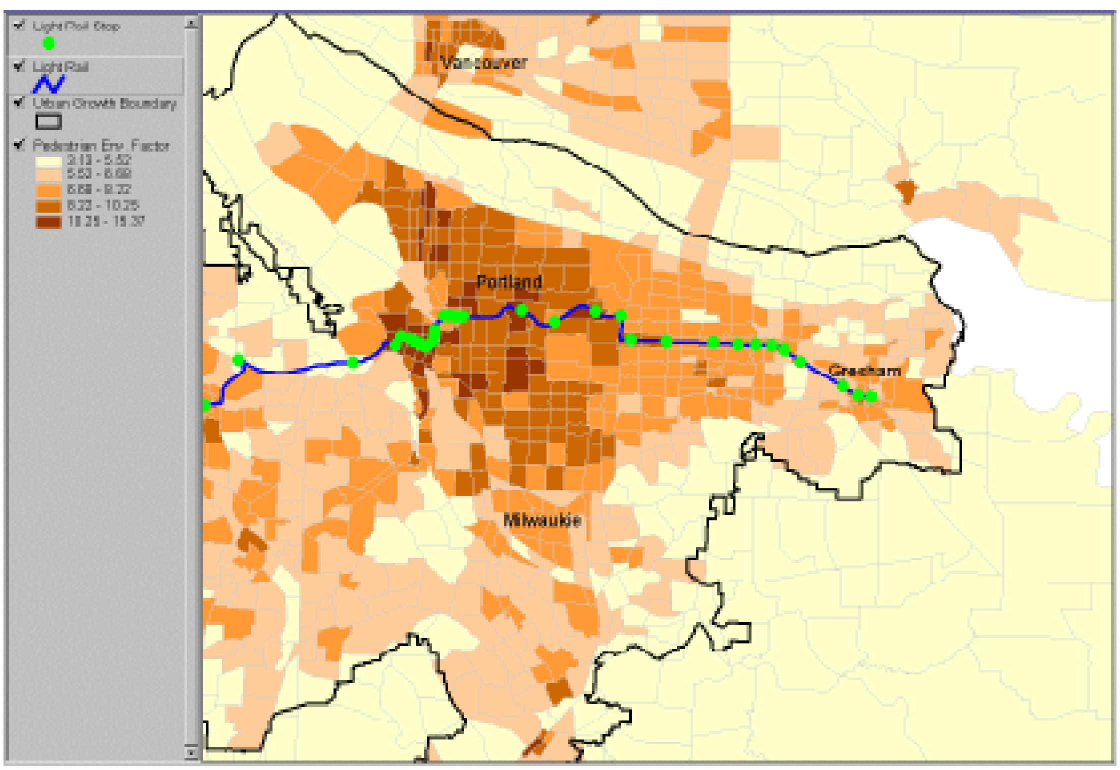
- Design communities so walking is convenient
- Implement projects that are likely to increase walking
- Improve walkway connections to bus stops and rail stations
- Encourage those who walk, bike and drive to share the road safely

Data Aggregation

As part of the Travel Model Improvement Program (TMIP), Metro has been developing capabilities to aggregate geographic data to different zone systems.



2005 Transit Accessibility Index



Pedestrian Environment Factors

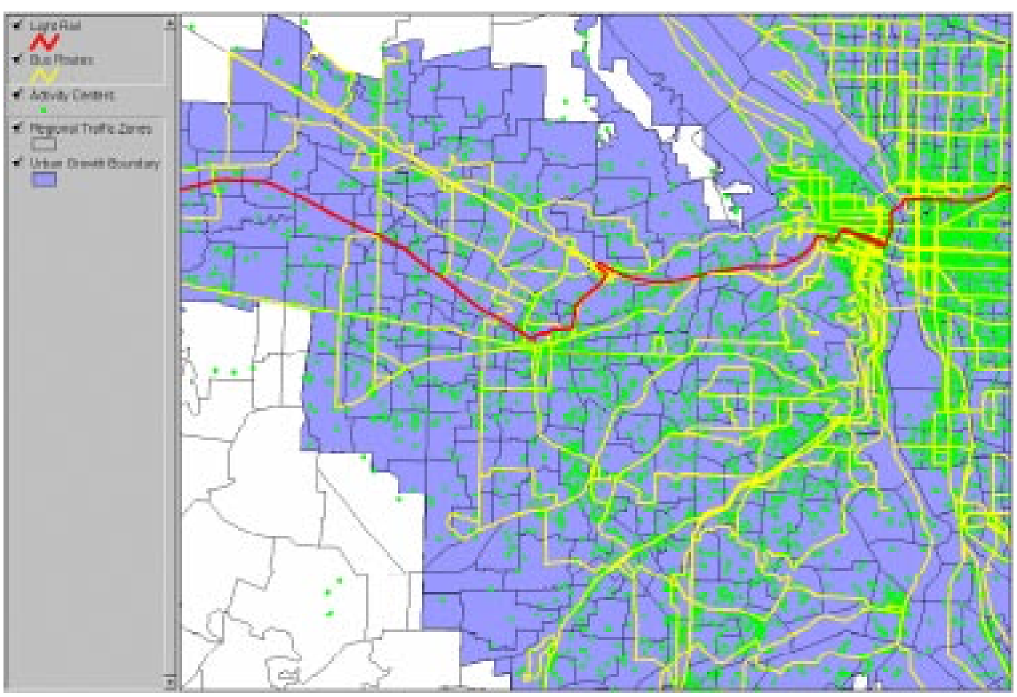
Transportation models require zone-based measures in order to create an origin-destination trip matrix that is then assigned to the model network. As GIS is able to analyze datasets at different levels, from individual points to polygons representing streets, tracts, TAZ's or cities, it is a more flexible and robust environment in which to conduct some of the data analysis. However, the traffic assignment model still requires TAZ definition and thus Metro planners have developed programs to aggregate data to the TAZ geography, employing smoothing or averaging techniques.

This undermines the accuracy and value of the analysis performed in "real geographic space". In a sense, the model is simplifying data unnecessarily in order to meet the model programming requirements. This anomaly is recognized in Metro and other organizations including the Travel Model Improvement Program (TMIP), sponsored by Federal Highway Administration (FHWA), which is developing techniques to overcome some of these limitations. Metro has also been developing their own methods to extend the modeling accuracy. For example, the development of the activity-based models that model person-trip tours along activity chains is a radical departure from single trip matrix assignment. The simultaneous modeling of trip chains together with mode choice and trip distribution models opens up a wealth of new opportunities to model travel behavior more realistically. Thus far, the trip chains have not been integrated with the GIS but Metro is looking to do this as time and resources allow.

Given Metro's progressive approach to model development and willingness to experiment with new technologies, it is not surprising that they have been selected to participate in the Transportation Analysis & Simulation System System (TRANSIMS) project. One of the TRANSIMS participants, Los Alamos National Laboratories, have taken a radical approach to the data definition problem and propose to model trips based on household-to-activity paths (point-to-point) rather than zone-to-zone paths. The TRANSIMS project is using Metro as a development test site. While theoretically feasible, this adds a complexity and order of magnitude to the numerical modeling involved in traffic forecasting that challenges computing resources in local government agencies. It is unlikely that a breakthrough in this field will occur before 2000, but it is clear that when this happens the accurate spatial referencing and network analysis capabilities of GIS will be a core component.

Mapping and Display of Model Outputs

The *trip generation, trip distribution* and *mode choice* models are developed by Metro and attribute the data



Regional Traffic Analysis Zones

to points and polygons in the GIS. For *trip assignment*, Metro uses the EMME/2 travel forecasting software that has its own network coding and data format that is not compatible with GIS.

In order to efficiently manage the array of transportation projects used in modeling scenarios, Metro employs an Arc/Info based project management software system. This system is used to catalog and track projects for modeling. The system is used to create EMME/2 compatible networks for analysis. Metro staff also utilize a suite of ArcView tools for conversion (import and export) and editing of EMME/2 data within the GIS environment. These programs further facilitate the display and analysis of modeling results.

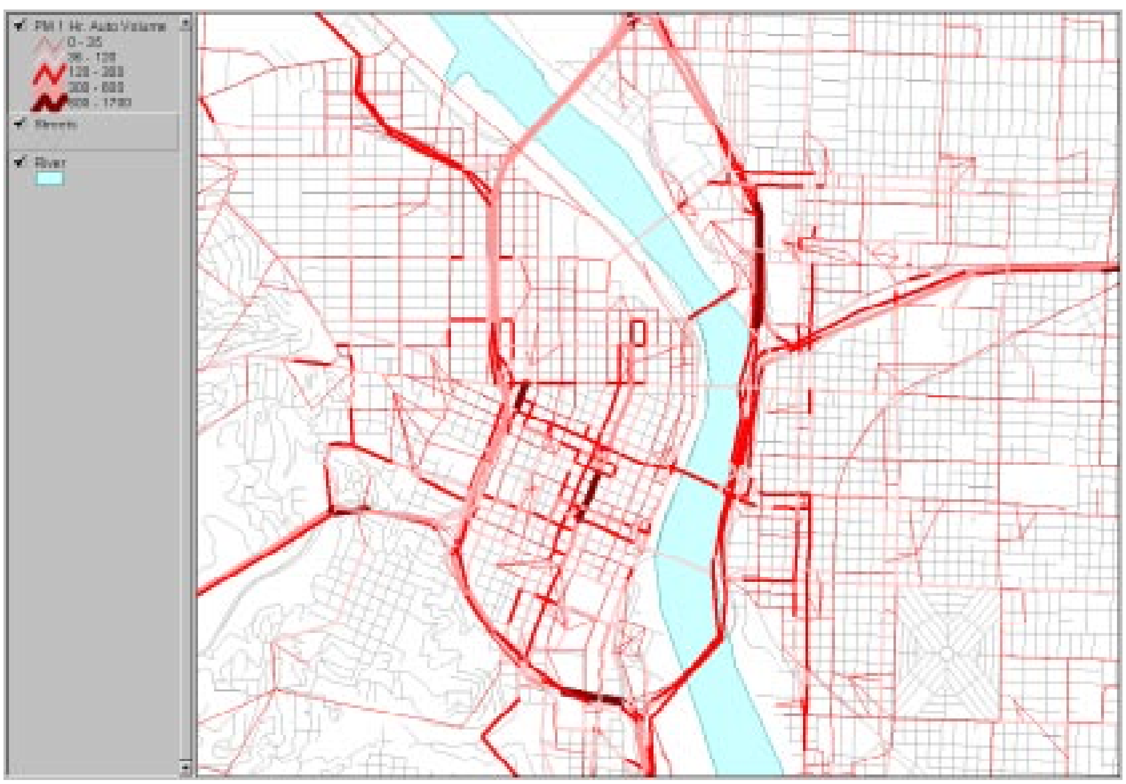
At this time, the model networks are coded in EMME/2 and then exported to ArcView, which displays them as simplified links in close proximity to the street network. One improvement would be to code up the networks in GIS using the street centerline as the source network file, or conflate the existing model networks to the street centerline file as some other agencies have done (see Case Study 1: SCAG ACCESS Project for an example).

Other Applications

The modelers have developed a number of GIS programs and tools for each stage of the modeling process:

- Validation tools help support both model input preparation and results analysis. GIS visuals represent a powerful tool to validate modeling data.
- Network conversion and editing tools to integrate modeling data and GIS.
- Analysis tools to help build estimation and validation data sets (examples include calculating transit stop accessibility).

Initially these programs were written using Arc Macro Language in Arc/Info. Latterly the GIS programmers have been using ArcView more as the capabilities of ArcView have improved with Version 3.0. For example, determination of employment catchment areas or population size within ½ mile of a location can be performed with ArcView's Network Analyst extension. This trend is likely to continue in the future with the benefit that these capabilities will be more accessible by a wider range of staff in addition to the GIS specialists.

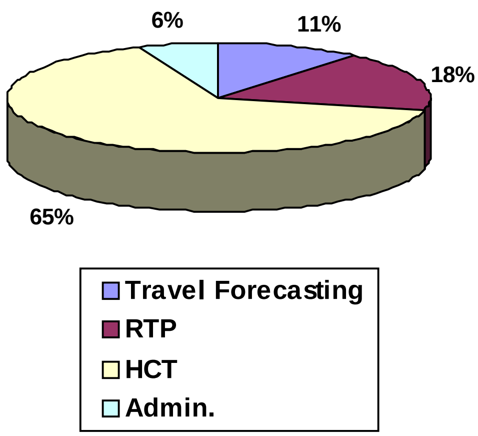


Emme/2 Model Network in ArcView

Transportation and Data Resource Center (DRC) Costs

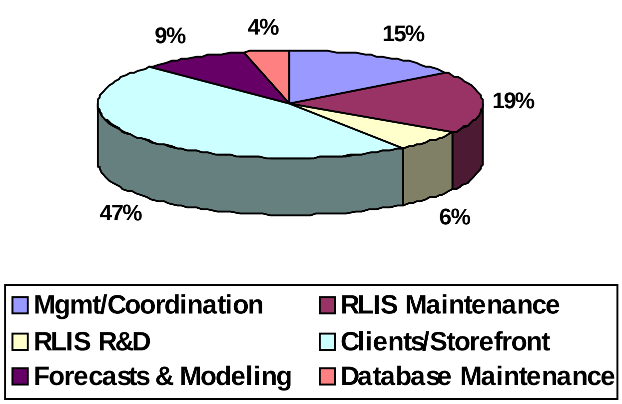
Last year, the transportation department had expenditures of nearly $11 million. The Travel Forecasting Section comprised approximately 11 percent of the total.

1996/97 Metro Transportation Department Expenditures



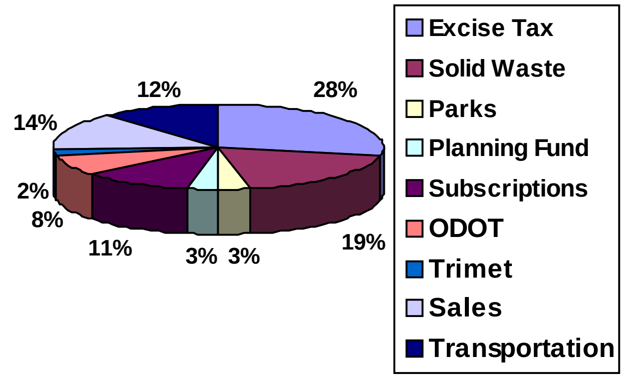
The current operating budget for DRC is approximately $1.9 million. Maintenance combined with R&D efforts comprises about 25 percent of this budget.

DRC Programs



The Transportation Department contributes approximately 12 percent of the DRC yearly operating budget. The following figure highlights funding sources for the DRC:

DRC Funding Sources



Service fees derive approximately 25 percent of the DRC revenues. Subscriptions or sales and service to area jurisdictions comprise 11 percent and projects for non-jurisdictional customers account for 14 percent of revenues.

The current year's computer budget to support DRC activities is roughly $277,000 (hardware and software and maintenance). Travel forecasting's yearly computer expenditures are in the neighborhood of $250,000.

It is difficult to isolate the model GIS development costs as the "GIS centric" approach to model development and implementation is integrated closely with the RLIS and Data Resource Center. These would not be so easily justified without the sophisticated modeling approach that needs the GIS. Likewise the model development would not be feasible without the resources and skills of the RLIS and Data Resource Center. Crudely, the Metro Transportation Department comprises approximately 12 percent of the DRC budget and can therefore be expected to consume a similar proportion of the GIS resources.

Benefits of a Regional GIS

It would not be possible to support the travel model improvements without the GIS databases and programs. The GIS is more than simply a technique for producing digital maps. Rather it represents a complete system for managing data to support a wide range of business activities that Metro is mandated to perform. The benefits are therefore agency wide and not just specific to any one section. The main benefits of having a centralized RLIS and Data Resource Center are:

- Having a regional database saves local jurisdictions duplicating data
- Centralized data management is more cost-effective and efficient than among 26 jurisdictions – as evidenced by the RLIS-Lite CD-ROM that is updated quarterly and distributed to Metro members
- The Regional Data Center is of sufficient size (8-10 employees) to provide a range of specialist services that would be difficult for any one agency to afford. These specialists assist jurisdictions in updating parcel maps, enhancing the street centerline file or creating new data layers, and become a valuable resource of expertise for the jurisdictions.
- There is a Regional Data Sharing Committee comprising representatives of the jurisdictions that meets regularly to coordinate data management and data sharing activities.
- Metro has taken a lead in adopting GIS technology and demonstrating how GIS can be used to support planning activities. Other cities in the region have followed Metro's lead and have adopted the same GIS platforms – Arc/Info and ArcView - which makes data sharing and updating easier.

Not all the jurisdictions in the Metro area participate in these activities – the City of Portland is an exception that has its own bureau – but most cities and counties look to Metro as the lead agency in GIS and spatial data management.

Metro is in the process of updating its GIS technology to enable the spatial data to be managed on a central data server as well as the attribute data. They have selected ESRI's Spatial Data Engine (SDE) software and Oracle Database Management System (DBMS) as their future systems. These will enable wider access to the GIS internally and via the Internet. SDE supports access to the Internet via an Internet Map Server that will allow remote users to log-on and query the GIS, perform spatial analyses and create maps that can be printed locally. This is another advantage of a centralized Regional Data Center and the economies of scale that make this configuration feasible.

Benefits for Transportation Planning

These benefits extend to the Travel Forecasting section which perform a number of local planning and modeling exercises for jurisdictions. GIS is a proven tool, which increasingly and continually assists in the improvement of the travel-modeling program at Metro. Benefits of using GIS for Travel Forecasting include:

- The ability to continually enhance travel models with more quantitative databases.
- Consistent means to collect and organize information for validation, analysis, and dissemination.

The support at Metro of a comprehensive regional GIS system is certainly a benefit to the advancement of the travel modeling efforts. However, the aggressive nature of the Metro's modeling program also facilitates the growth of the GIS. The TMIP work serves as a good example of this process. The detailed network requirements of TRANSIMS has prompted the Travel Forecasting Section to embark on an extensive data collection effort including signals, signage, speeds, etc. for the regions roadways. Most of this data does not exist in GIS form at this time. However, this effort will augment the regional database with elements of use that stretch beyond transportation planning analysis.

Lessons Learned

The following lessons has been learned in utilizing GIS in support of model development efforts:

Lessons Learned

- GIS expands transportation model analysis capabilities.
- Desktop applications (such as ArcView) are becoming more prevalent for GIS based analysis. These applications are generally easier to use and available to a broader base of transportation analysis.
- GIS is best used to support model data inputs and display of outputs rather than modeling itself.
- GIS system takes time to develop and require agency commitment to ensure adequate maintenance and usability.
- GIS was justified in part by modeling needs to develop enhanced procedures to meet agency goals and mandates, i.e. GIS not an option but a core technology for Metro's business.

The case study of Metro demonstrates how GIS can be used to support urban transportation planning. GIS databases provide an effective system for data management and GIS contain a number of tools for spatial analysis and data display that add value to the modeling process. GIS is likely to play an increasing role in transportation planning and is an important technology that will help shape future model development.

References

"Data Collection in the Portland, Oregon Metropolitan Area Case Study." Final Report. Cambridge Systematics. Travel Model Improvement Program, USDOT. Report No. DOT-T-97-09, 1996.

"A System of Activity-Based Models for Portland, Oregon. A Demonstration Project for the FHWA Travel Model Improvement Program (TMIP)." Draft Final Report. Cambridge Systematics and Mark Bradley Research and Consulting. Metro. December, 1997.

Contacts

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TMIP
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Office of Environment and Planning
Washington, DC 20590

The Case Study was prepared by:

GIS/Trans, Ltd.
675 Massachusetts Ave, 14th Floor
Cambridge, MA 02139
Phone: (617) 354-2771
Fax: (617) 354-8964
http://www.gistrans.com

For further information please contact:

Steve Perone
Senior Transportation Planner
Metro
600 Northeast Grand Avenue
Portland, OR 97232
Phone: (503) 797-1771
E-mail: perones@metro.dst.or.us

Michael Culp
Transportation Engineer
Federal Highway Administration
Office of Environment and Planning, HEP-20
400 Seventh Street, SW
Washington, DC 20590
Phone: (202) 366-9229
E-mail: michael.culp@fhwa.dot.gov

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U.S. Department of Transportation
Federal Highway Administration
Office of Environment and Planning
400 Seventh Street, SW
HEP-20
Washington, DC 20590